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ABSTRACT

This guide presents units involved in unifying the student's views of energy, environment, and economic issues in making decisions required of the citizen. Goals, concepts, and background information are presented at the beginning of the booklet. A pretest of relevant knowledge is provided. Other units include: (1) example discussion questions: (2) suggested learning experiences: (3) interdisciplinary projects which include activities in Art, English, History, Driver Training, and Consumer Education: (4) projects for advanced students: (5) elementary and middle school activities: and (6) word games. A resource section including organizations, businesses, publications, and government agencies concludes the booklet. (RE)

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AN EDUCATOR'S GUIDE TO THE THREE Es:

Ecology/Economics/Energy

SE 030 642

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An Educator's Guide to The Three Es:

ENERGY, ECOLOGY, ECONOMICS

By Sally R. Campbell

About the author:

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Today, the energy shortage stands as one of the nation's most challenging, demanding problems. In a relatively short time, the once cheap and abundant supply of fossil fuels has become scarce and costly. The demand continues to increase while supplies dwindle; and at the same time, both our economy and way of life depend on these scarce energy resources.

So far, we have not launched an effective conservation program to make fuel supplies last until we develop new sources. Also, we have not developed acceptable alternative sources of energy. In many cases, alternatives to petroleum come into direct conflict with environmental concerns.

Nuclear energy with all its potential has limited value as a *near-term* solution to energy shortages because of the threats it poses to the environment. Both production and use of our abundant coal supplies also pose environmental problems as does synthetic fuel development. And while solar energy appears to be environmentally safe, it is currently inadequate as a viable substitute for oil/petroleum.

Ecological concerns also limit steps we might take toward fuel conservation and production. Emission controls help fight pollution, but result in less efficient fuel use. Offshore drilling and strip mining carry the attendant threats of oil spills and land destruction.

At the heart of the current energy situation is the central economic problem of scarcity—the supply is limited while demand is unlimited. When demand for any item is greater than supply, prices usually go up. Higher prices provide the economic incentive to increase the supply and at the same time serve to dampen the demand. This economic principle is at work in the energy shortage in those areas where prices move up and down freely.

However, in a mixed economy such as ours, many factors come into play. Not only the factor of oil supply restrictions due to OPEC policies, but our government's policies and regulations also have influenced the supply, demand, and price of various forms of energy in recent years through tax incentives and penalties, price controls, import quotas, restrictions on production, allocation programs, and regulations related to the production and distribution of energy resources.

As a result, the classic economic problem of scarcity has not met with the classic economic solution of bringing demand and supply into balance via the price mechanism.

In our energy intensive economy, fuel scarcity coupled with increased demand aggravates any number of other economic problems. Inflation is a current example. Rising fuel costs increase the price of all the goods and services which depend on fuel for their production and distribution.

Unemployment is another example. As fuel becomes more scarce and costly, production costs increase and the capital available for new plants and equipment decreases. This means less expansion by industry and fewer jobs for workers.

Trade deficits and the falling value of the dollar in world markets are also directly related to the short supply and high demand for oil. As we import oil at higher prices without a corresponding balance of exports, we have a trade deficit. In other words, when we buy more than we sell in world markets, the U.S. loses purchasing power for its dollars or, the dollar is devalued.

These are just a few of the many ways energy, ecology, and economic problems interact to have an impact on our daily lives. This educator resource was developed to assist students in exploring issues related to the three Es. It serves as a guide to:

- introducing basic concepts on energy, ecology, and economics and the interaction among the three.
- understanding some of the challenges and problems related to the energy situation.
- identifying possible and appropriate action that could be taken in solving some of these problems.
- promoting constructive changes in attitude and behavior in dealing with the energy challenge.

STUDENT GOALS

As a result of studying the energy issues and their impact upon our environment and economy, students should be able to:

- define basic terms used in discussing energy, ecology, and related economic concepts.
- understand how changing supply, demand, and national policies will affect our future with respect to cost, usage, and new sources of energy.
- identify ecological concerns related to energy and possible action to take in protecting the environment while meeting needs for energy.
- describe the challenges facing the U.S. and the world concerning energy resources, ecology, and economics.
- analyze the interrelationship among energy, ecology, and economic problems and solutions and the various ways each affects the others.
- identify the consequences of failing to deal with the current challenges related to energy, ecology, and their economic impacts.
- propose a plan of action for individuals to follow in helping to solve the problems presented by energy shortages, threats to the environment, and related economic dislocations.
- evaluate public policy making related to energy, ecology, and economics in terms of effectiveness and long-term results.

CONCEPTS AND WORDS TO KNOW

As students explore the interrelationship among energy, ecology, and economic issues, key concepts help to provide a framework for organizing and using the subject matter. A common knowledge of certain words and phrases also facilitates learning and discussion.

The following concepts and words to know include introductory ideas and terminology related to study of the three Es.

Key Concepts

Fossil fuel supplies do not meet demands.

Ecological balances are threatened.

Energy and ecology problems are related.

Solutions and policies for energy and ecology problems carry economic impact and consequences.

Meeting the challenges of the three Es calls for informed citizens and voters who are willing and able to act responsibly.

Words and Phrases to Know

ENERGY TERMS

black-out
British Thermal Unit
brown-out
coal conversion
electricity
energy efficiency ratio
energy efficiency standards
energy intensive
fossil fuels
fuel
gasification
gasohol
geothermal energy
heating oil
hydro-electric
insulation
liquification
meltdown
natural gas
nuclear energy
nuclear reactor
offshore drilling
OPEC
petrochemical
petroleum
plutonium
power
primary source
pyrolysis
secondary source
shale oil
solar energy
strip mining
synthetic fuel
voltage cutback

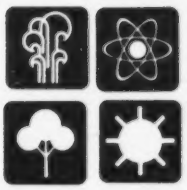
ECOLOGY TERMS

aeration
by-product
carbon monoxide
catalytic converter
clean fuel
conservation
contaminate
ecology
emission
environmental protection
erosion
high sulfur
land disruption
low sulfur
oil spill
ozone layer
pollutants
pollution control devices
radiation
radioactive waste
recycle
solid waste
sulfur dioxide
thermal pollution
water table

ECONOMIC TERMS

abundance
allocation
balance of payments
capital intensive
cartel
competition
cost benefit analysis
demand
depression
domestic
economic growth
embargo
export
growth rate
import
inflation
labor intensive
multinational
oligopoly
price
price controls
prosperity
rationing
recession
research and development
reserves
scarcity
supply
surplus
tax incentive
trade deficit
trade offs
unemployment
value of the dollar
windfall profits tax

GENERALIZATIONS



A generalization refers to a basic truth or factual statement which is universal to individual concepts. The following generalizations are presented as a core of information related to energy, ecology, and economic issues upon which students can base further inquiry, research, and value judgments.

Available, usable energy, particularly oil/petroleum cannot meet future worldwide demands.

The energy shortage brings us to terms with the basic economic concept that resources are limited and interrelated.

As the population increases, competition for energy and other natural resources will increase.

Establishing priorities for the use of scarce resources will become increasingly important as demands escalate.

Conservation, coupled with emphasis on developing new energy resources, seems to offer a reasonable and practical immediate approach to the energy problem.

The combined, cooperative efforts of all Americans will help to meet the challenges of energy shortages.

New attitudes and altered lifestyles appear to be necessary to help conserve energy and eliminate the waste of resources.

Higher fuel prices serve to reduce demand for fuel among users who are unable or unwilling to pay the price.

To help solve the energy problem, profits from higher fuel prices can be invested in the development and production of more fuel and new energy sources.

New energy sources and the technology for developing and using them offer a long-range solution for meeting world energy needs.

Some methods of conserving energy and increasing energy production pose threats to the environment.

Conflicts between protecting the environment and meeting energy demands center on standards and restrictions related to strip mining, offshore drilling, auto emission controls, pipelines, oil spills, nuclear waste, and sulfur dioxide emissions from coal-powered plants and other pollution connected with energy use and production.

Energy costs will reflect the costs of environmental protection.

Our economic system is highly dependent on an adequate supply of energy.

There are a variety of ways to reduce energy consumption during peak demand periods, which could result in fewer costly additions to generating capacity.

Economic problems related to energy shortages include inflation, unemployment, trade deficits, and the falling value of U.S. dollars in world markets.

Shortages of domestic fuel supplies necessitate fuel imports which, without a corresponding balance of exports, result in a trade deficit and a decline in the value of the U.S. dollar.

The ultimate goals of any long-range energy policy will include an adequate, reliable energy supply at the lowest possible cost consistent with necessary environmental safeguards and with minimum economic dislocations and inequities.

An equitable world-wide distribution of scarce energy resources will depend largely on successful negotiation and cooperation among countries.

As long as the U.S. depends heavily on foreign fuel, our relationship and negotiating power with OPEC, which controls the quantity and price of petroleum exported to other nations, will remain vitally important.

Energy problems may result in new legislation and increased government involvement which will affect commerce and industry as well as private citizens.

Conservation measures involving some inconvenience and discomfort seem preferable to measures that might involve such economic dislocations as plant shutdowns, layoffs, and unemployment.

Conservation practiced by consumers and commercial establishments may produce fewer serious economic consequences than cutbacks in industrial uses of energy.

Individual efforts, when taken collectively, can result in substantial conservation of energy and other scarce resources.

Many uncertainties surround the supply of energy including the political situation, legislation, economic conditions, environmental concerns, technology, and effectiveness of conservation measures.

INTRODUCING ENERGY, ECOLOGY, AND

Pretests

Pretests can be successfully used to involve students in new topics. The completion exercises that follow have no **right** or **wrong** answers, but merely serve to stimulate thought and inquiry processes. The multiple choice questions cover basic facts on the three Es and are a way to determine students' familiarity with the material.

Completion: Ask students to complete the following statements quickly, briefly, and without concern for **right** answers. Consider what their answers reveal about student attitudes and understanding. Follow up with discussion and research into areas of most interest and importance.

1. The toughest energy conservation measure for me would be...
2. Three things I would do willingly to conserve energy are...
3. Three things I would do willingly to protect the environment from energy-using and producing threats are...
4. To me the worst thing about an energy shortage is...
5. If I had the authority to make laws for energy conservation, three laws I would make are...
6. Five appliances my family and I could use less to conserve energy are...
7. The most important thing I think government could do about energy conservation is...
8. I would be willing to relax environmental standards to produce more energy only if...
9. I think fuel rationing would be hardest for...
10. I think reducing demands for energy by increasing prices would be hardest for...
11. I think we could reduce the demand for energy by...
12. I think the best source of energy to develop for the future is _____ because...
13. The three greatest difficulties in increasing production of energy are...
14. The most significant three things consumers can do about energy, ecology, and related economic problems are...
15. In my opinion, the three most serious consequences of ignoring energy and related ecology problems would be...

Multiple Choice: Ask students to answer the following multiple choice questions. Check their answers to learn how much they know and understand about energy, ecology, and related economic problems. The following is based on material available from the U.S. Department of Energy.

___ 1. Fossil fuels include all of the following except:
a) coal c) oil
b) natural gas d) wood

___ 2. The primary source of energy that meets the greatest percent of U.S. energy demands is:
a) coal c) natural gas
b) nuclear d) oil

___ 3. In the U.S., the group using the largest share of petroleum is:
a) industry
b) residential
c) transportation
d) commercial

ECONOMIC ISSUES

___ 4. A windfall profits tax refers to a tax on:
a) gasoline
b) service stations
c) oil company profits
d) oil company sales

___ 5. The amount of oil **used** in the U.S. as compared to the amount **produced** is:
a) only as much as
b) slightly more than
c) only half as much
d) almost twice as much

___ 6. Consumer products made from petroleum include all but:
a) plastic wrap
b) synthetic leather
c) acrylic knits
d) batteries
e) pet food
f) detergent

___ 7. Disadvantages of solar energy include all but:
a) difficulty of storage and transportation
b) technology not fully developed
c) pollution of air and water
d) high expense of installation for both new and existing structures

___ 8. For its oil supply, the U.S. imports from the Organization of Petroleum Exporting Countries (OPEC) between:
a) 20 and 30 percent
b) 30 and 40 percent
c) 40 and 50 percent
d) 50 and 75 percent

___ 9. The primary economic problem resulting from ever-increasing oil imports at ever-increasing prices is:
a) trade deficit
b) unemployment
c) recession
d) short supply

___ 10. Ways to dampen the demand for oil could include all but:
a) rationing
b) letting prices go up as supplies dwindle
c) government price controls
d) tax and price penalties for heavy users

___ 11. In American homes the greatest amount of energy is used for:
a) lighting
b) heating and cooling
c) electric appliances
d) gas appliances

___ 12. The disadvantages of turning to nuclear energy as an alternative to fuel oil include all but:
a) the cost of developing and building nuclear reactors
b) the level of radioactive waste
c) inefficiency of nuclear fuel
d) the plutonium by-product that is used for atomic bombs and must be isolated

___ 13. Natural gas can be used for all but one of the following:
a) to heat homes and buildings
b) to produce electricity
c) to run an automobile
d) to run some major home appliances

___ 14. Fuel conservation by consumers for their homes and cars could cause fewer economic problems than conservation by business and industry because:
a) consumers make up the least important sector of the economy
b) consumers waste more energy than other fuel users
c) significant energy cutbacks by business and industry would result in fewer jobs and lower productivity
d) consumers use more energy than business and industry

___ 15. Measures for conserving fuel in the home include all but:
a) insulating properly
b) installing storm windows and doors
c) using lightweight window curtains
d) laundering in cold water and limiting the use of a dishwasher

Answers to multiple choice:

1-d	6-e	11-b
2-d	7-c	12-c
3-c	8-c	13-c
4-d	9-a	14-c
5-d	10-c	15-c

DISCUSSION QUESTIONS

The following questions can lead to discussion, debate, and research on energy and its relationship to our environment and economy. Choose the questions most appropriate for your group depending on your subject matter area, the background and knowledge of your students, and the way you plan to use the questions.

1. In what ways might an energy shortage affect family life? Think in terms of benefits, hardships, and end results.

2. How can we expect lifestyles to change as a result of an energy shortage? Discuss how these changes might affect individuals in the classroom.

3. In what ways might we as a nation benefit from an energy shortage? Classify benefits under headings such as social, economic, political, environmental, and moral.

4. How can an energy shortage cause unemployment, business failures, recession, and possibly a major depression?

5. What are some measures we can take to minimize the economic consequences of an energy shortage?

6. How would you view the energy shortage if you were:

- building a new house
- buying a new or used car
- considering a change of location to another part of the country
- planning your future career
- planning the size of your family
- retiring on a moderate pension
- manufacturing appliances
- managing a large utility company
- managing a store in a shopping center

7. What are 15 things individuals can do to conserve energy? Classify conservation measures according to (1) use of car; (2) use of appliances; (3) heating and cooling the house; (4) new purchases; and (5) changes in lifestyle. What steps can individuals take in each of these areas to protect the environment?

8. What conflicts are likely to arise as we struggle to meet demands for energy and to protect the environment? Cite specific examples.

9. What are some of the proposed government measures for dealing with the energy situation? For protecting the environment? Discuss the pros and cons of proposals that you have read something about.

10. How do price controls on domestic oil and gas affect the price of imported oil? What is the impact of the controls on domestic production?

11. What can commercial establishments do to conserve energy? How would these measures affect employes, customers and management?

12. Why are many of the energy conservation measures directed at consumers and residential use of energy when this segment of the economy uses the smallest percentage of fuel?

13. What six countries in the world possess the highest oil reserves and what is the current political relationship of the U.S. with each of these countries?

14. Under what conditions can self-sufficiency in meeting this country's energy demands become a possible goal? What steps or developments would be necessary? How long might it take to achieve? What sacrifices might be necessary?

15. How might an energy shortage affect the average consumer's future purchasing decisions? Explain and give examples to illustrate.

16. What consumer products would likely to be in short supply as a result of an energy shortage? Why?

17. What other countries are also facing an energy shortage and what countries are in a position to gain from the energy situation?

18. How is government power and regulation likely to increase because of the energy situation and how might this affect business and individual taxpayers?

19. How can the following businesses and industries contribute to solving energy and ecology problems?

- utility companies
- airline companies
- insulation manufacturers
- oil companies
- construction companies
- auto companies
- major retailers
- chemical companies

20. What five changes would you personally be willing to make to conserve energy? To protect the environment? To improve economic conditions?

21. What role do you think government should play in conserving energy, increasing production of energy, protecting the environment from threats related to the use and production of energy?

22. What is the windfall profits tax and why is it called a tax on profits when it actually is levied on gross sales?

23. How do oil company net profits compare with those of

SUGGESTED LEARNING EXPERIENCES

other companies and industries over the last 20 years?

24. How has price per barrel of oil imported from OPEC changed since 1970? How might OPEC use oil as a political tool?

25. What are some of the ecological problems connected with development and use of synthetic fuels?

26. Water shortages are a recognized problem in many sections of the country today. Some predict disastrous water shortages in the future. Assuming these predictions to be true, review the preceding questions and apply them to a water shortage rather than energy. In addition, discuss the following questions directly related to water supply and demand.

- In recent years, where have water shortages been a problem and what have different geographic areas done about it?
- What are some water-saving devices that can be used in homes, schools, and commercial businesses?
- What is the status of the desalinization technology and does it relate to the energy situation?
- What are some of the more serious economic problems that could grow out of severe water shortages?
- Approximately how much water does the U.S. use annually and how does it break down among different groups of users, particularly residential, commercial, industrial, and agricultural?

Individual and group projects and activities give students an opportunity to become involved. Individual activities are particularly useful in adapting material to meet individual needs, abilities, and interests. Group projects may be carried out by the class or by groups or teams within the class.

Choose projects that are most appropriate for your individual students or for your group and for the concepts you are teaching.

Individual Student Activities

1. Investigate and report on ways consumers can conserve energy with home appliances, especially in their purchase, use and maintenance.

2. Find out what features on appliances consume extra energy. Discuss the benefits of each feature versus the added operating costs and energy consumption.

3. Investigate and report on the steps to conserve energy that manufacturers and retailers of home appliances can take in the design, marketing, promotion and advertising, and in educating consumers in the proper use of those appliances.

4. Discuss the pros and cons of legislation calling for efficiency ratings and standards for home appliances.

5. Write an advertisement for three major home appliances emphasizing efficient operation and energy conservation.

6. Explain at least three ways that the energy and ecology situations relate to each of the following economic conditions:

Inflation
Trade deficits
Value of the American dollar
Unemployment
Productivity

7. Bring to class at least three articles from current newspapers and magazines covering some aspect of the relationship among energy, ecology, and economics. Topics may include environmental and cost factors in mining coal or offshore drilling, environmental protection standards applied to the use of high sulfur coal, measures for conserving energy without closing businesses and schools, etc. Research the unsolved problems presented in the articles for a fuller understanding of the issues involved.

8. Draw up a list of at least five things you personally would be willing to do or not to do to conserve energy and protect the environment from energy-related pollution.

9. Conduct a research project to learn what three consumer energy conservation measures would save the most energy:
- in home heating and cooling
- in use of home appliances
- in use of private automobiles

10. Find out costs in the local government budget for parking, street maintenance, traffic control, and other items related to driving. Compare costs with revenues from driver permits, licenses, gas tax, etc. Discuss whether car drivers are subsidized and, if so, how driving habits might change if drivers bore all expenses related to cars.

11. Where they apply, carry out the preceding projects as they relate to water rather than energy shortages. Use the following projects as well, particularly if you live in an area where water supplies are at issue.

- Compare energy shortages to water shortages in terms of:
  - —current and predicted supply and demand situations
  - —environmental concerns
  - —economic impact
  - —possibilities for individual, group and government action
  - —impact on lifestyle
- Find out at least ten steps we can take to:
  - —conserve water supplies
  - —allocate limited supplies fairly
  - —increase supplies of pure water

Group Projects

1. Form an energy conservation task force to explore ways to save energy in the school, in the home, and in the community. Set up and distribute conservation guidelines based on the findings.

2. Set up an energy information center to provide data on conservation, supply and demand, research and development, government agencies dealing with energy needs and legislation related to energy and fuel.

3. Develop a series of bulletin boards using pictures, articles, and clippings from current magazines and newspapers which depict both the current and the future energy situation as well as related ecological and economic conditions.

4. Conduct a school or community-wide survey to find out how different individuals and families are reacting to the energy situation and what they are doing about it. Summarize and report the findings.

5. Have a brainstorming session on ways to inform and motivate the public to conserve energy.

6. Hold a conference on "The Economics of Energy." Call in experts to present the economic aspects of:

- conservation
- conflicts between energy production and environmental protection
- development of new sources of energy
- the energy shortage in the United States
- government policies and regulations related to energy

7. Set up several debate teams to research and argue the following or related points:

- offshore drilling versus environmental protection
- fuel rationing versus increasing prices to cut demand
- voluntary versus mandatory conservation measures
- benefits of nuclear reactors versus risks

Try to bring out all of the advantages and disadvantages of each position during the debate.

8. Divide the class into four groups, each to represent policy makers for government, for business and industry, for environmentalists, and for consumers. Ask each group to recommend at least five things it would do to:

- reduce America's dependence on foreign oil.
- protect the environment while developing new sources of energy and increasing energy production.
- dampen demand for energy and encourage conservation.
- arrive at the fairest possible distribution of limited fuel supplies.

Where one group's recommendations conflict with another's, work toward a resolution of differences making whatever compromises are necessary to satisfy the most people.

9. Develop a chart to indicate cost, adequacy, technological readiness, reliability, environmental hazards, and future potential for the following sources of energy:

Offshore Drilling
Oil Shale
Solar
Nuclear
Wind
Geothermal
Coal Gasification
Coal Liquification
Pyrolysis
Helium
Hydrogen
Synthetic Fuels

10. Ask students to keep an energy log for one day, checking each time they:

- use energy directly—turn on an appliance.
- use energy indirectly—run hot water or use ice cubes.
- use public energy—ride the bus or use lights in a public building.
- use a product made of petrochemicals—synthetic fabrics or plastic wraps.
- use a product which requires energy to manufacture—shoes, furniture, appliances, etc.

Be particularly alert to hidden energy consumption—the uses that are not obvious. Go over the energy logs and check off unnecessary uses of energy. Based on the logs, list the 25 or 30 most frequent uses of energy and arrange them in order, from most necessary to least necessary.

11. If, and as they apply, carry out the preceding group projects in connection with water shortages. In addition, contact the U.S. Water Resources Council, 2120 L Street, NW, Washington, DC 20037 for information on water supplies.

INTERDISCIPLINARY PROJECTS

The following projects and activities are directed to individual subject matter areas. Choose those which are most appropriate for the subject you teach, or, if desired, incorporate them into an interdisciplinary school program on the three Es.

Art

1. Make posters and bulletin board displays showing various aspects of the energy situation. Arrange to show these in the school, and if possible, in public buildings and retail stores in the community.

2. Draw cartoons on the energy shortage for publication in the school and/or local newspapers. Cartoons could show humorous aspects of conserving energy or possibly some of the incongruities of "little savings" events versus "massive waste."

3. Carry out similar activities on ecology and economic concerns related to energy.

English

1. Write essays, editorials, and short stories on the energy situation. Submit these to the school and/or local papers. Possible topics are:

- Why I prefer energy-efficient cars
- Conserving energy is the best thing that ever happened at our house
- Opportunity costs applied to the energy shortage
- Car pools—a great way to meet people and make friends
- Advantages of the 55 mile-an-hour speed limit
- Water, Water Everywhere—Save a Drop to Drink

2. Make up humorous slogans on conserving energy such as "Eat a cold meal tonight," or "Skip a hot bath today." Involve the art department in making posters to illustrate the slogans.

Science

1. Research and report on expected future sources of energy and the advantages and disadvantages of each. Include geothermal power, nuclear power, shale oil, gasification of coal, and solar energy. Discuss in particular the economic, technological, and environmental difficulties involved in developing each of these sources.

2. Write brief papers explaining the meaning of certain technical energy terms such as fossil fuels, energy efficiency ratio, British thermal unit, watt and kilowatt, geothermal and nuclear. Compile the information as a dictionary of energy terms or write it for publication as an article.

3. Explore and report on the possible environmental consequences of a full-scale fuel discovery and production program.

4. Research and report on desalinization technology as an answer for water shortages. Consider feasibility, practicality, and cost.

History

1. Compare the current energy situation with previous shortages of critical commodities in the U.S. and previous shortages in other nations. How do the situations differ? How are they similar? What new elements need to be considered in the current situation? What can we learn from the past?

2. Report on the gas rationing program during World War II. How did it work? What were the major problems? What were the costs of administering the program? How does the situation differ today?

3. Investigate and report on the environmental movement and its connection with the use and production of energy. Which threats to the environment can be traced to energy production? To energy usage? What environmental sacrifices have been made and may be necessary in the future to produce more energy? What ecological imbalances and environmental problems have resulted unnecessarily?

4. Draw a timeline from 1800 to the present to illustrate major inventions and events related to energy. Draw a similar timeline from 1900 to the present covering major events in the ecology movement. Include approximate year that different threats to the environment were recognized as well as action taken and laws passed to deal with energy-related environmental problems.

Economics

1. Debate the following two approaches to the energy shortage:

- A system of rationing, legislation, and government action to insure equitable distribution of scarce fuels, an increased production, and the development of alternate sources.

Versus

- Free market system of rising prices for scarce fuels which would dampen demand, stimulate increased production through new technology, and hasten the search for cheaper substitutes and alternate sources of energy.

2. Collect statistics on current sources and uses of energy. Prepare charts to illustrate—

- where we get energy
- how we use energy
- how much energy is wasted
- which segments of the economy use the greatest amount of energy
- the types of fuels used for different end uses

Conduct a similar project on water shortages.

3. Review the following headlines:

"Import Quotas Established for Foreign Oil"

"Solar Research and Development Funding Up 20%"

"Environmentalists Block Offshore Drilling"

"President Pushes Synfuel"

"Congress Debates Windfall Profits Tax"

"OPEC Raises Oil Prices"

Consider each of these headlines and find at least five similar ones in current newspapers. Discuss what each event could mean in terms of:

- overall energy prices
- prices of different fuels
- prices of other goods and services
- environmental protection
- development of new domestic energy sources
- legislation and government regulation

Ask students to assume one of the following roles and to assess what effect these events would have on each one and how each might react:

- producer of natural gas
- leader of environmental group
- coal company president
- manufacturer of offshore drilling equipment
- electric utility company official
- consumer
- top executive of an oil company with foreign oil interests

4. Relate the energy situation to the following economic concepts:

- inflation
- trade deficit
- productivity
- price mechanism
- supply and demand
- trade off
- opportunity cost
- international trade
- value of the dollar

Home Economics

1. In a crystal ball session, have students predict lifestyle changes that a long-term energy shortage could bring about which would affect: personal values and goals, family life, and homemaking. Discuss the pros and cons of predicted changes —would they be good for us as a nation and as individuals, or would they impose possible destructive tensions and hardships? What new concepts might these changes bring to family life and home economics education?

Conduct a similar crystal ball session for water shortages.

2. Investigate the power consumption of different home appliances in terms of:

- energy efficiency ratio
- operating costs
- average kW•h consumed per year by various appliances
- conservation possibilities

Study water consumption and conservation possibilities for home appliances, too.

3. Determine ways to conserve energy in the home. Estimate energy and utility bill savings.

Driver Training

1. Obtain the latest mileage data from EPA and identify the five most and five least fuel efficient autos with the miles-per-gallon figures for each. Discuss under what circumstances you might buy a less rather than a more efficient car.

2. Write and send to school and local papers an article on driving

habits that conserve fuels and increase mileage.

3. Conduct research and interviews with auto executives and transportation experts on the following topics:

- auto design and fuel economy
- effects of the 55 mph speed limit
- improving public transportation
- emission controls and fuel economy
- allocation of public funds for mass transit vs. highway improvements vs. energy research and development

Consumer Education

1. Categorize, using the following headings, the ways consumers may be most severely affected by fuel shortages:

- use of home appliances
- use of automobiles
- purchase of new consumer goods
- heating and cooling houses
- taking vacations
- beating inflation

2. Predict the ways in which consumer choices and spending patterns may change in these categories as a result of an energy shortage:

- foods
- clothing and textiles
- automobiles
- home appliances
- travel
- insurance
- home maintenance and improvement
- entertainment

3. Call the office of your state and national legislators for information about legislation that is pending or recently passed that is related to the three Es. Ask for copies or summaries of the bills and discuss how each would affect consumers, taxpayers, industry, business, the economy and the environment.

4. Review your own consumer spending over the last six months to determine what, if any, choices were made wholly or partly due to the energy situation. Can you foresee any buying decisions that may change due to an energy shortage?

Student Body Activities

Student body activities offer an opportunity for the entire school to participate and, at the same time, to use the activity in such a way as to make an informative contribution to the community. Select projects that are appropriate and challenging.

1. Conduct a publicity campaign using newspapers, posters, bulletin boards, public meetings, and fliers to create public awareness of the energy situation, to inform people of ways to conserve energy, and to motivate conservation.

2. Set up a resource center in the school with up-to-date information on energy usage, conservation, supplies, demand and legislation.

3. Set up conservation projects to be carried out by the student body. Suggestions are:

- a car pool number to call for arranging rides and cutting down on the number of drivers
- a "save a watt" answering service to answer questions on ways to save energy (this can be manned on certain hours during the day and publicized in the community)
- prepare and publish a booklet "Ways to Save Energy" in the house, in the school, in the car, in stores, and in the community

4. Recycling can be both an energy saver and environmental safeguard. For many products it requires less energy to recycle glass, paper, and metals than to make them from scratch. New developments in use of trash for fuel and building materials make recycling even more desirable. In addition, recycling reduces solid waste disposal problems. In the interests of both energy and environmental protection, set up a recycling collection center for paper, glass, and metals, particularly aluminum. For help in setting up a center, turn to existing local and regional recycling programs and environmental groups.

5. Set up water saving guidelines for:

- individual families
- schools
- communities
- industry
- agriculture

Distribute these guidelines or publish them in the school or local newspaper. Concentrate on the first three which students and families can carry out.

PROJECTS FOR ADVANCED STUDENTS

Projects for advanced students offer an opportunity to challenge more able youngsters to go into greater depth and then share findings with the class. All students can come away with a broader understanding of the energy situation and its environmental and economic side effects.

1. Research various forms of government involvement in the three Es since 1970. Investigate:

- laws and regulations—key provisions, enforcement, benefits, costs and economic impact.
- new and long-existing government agencies—their functions, jurisdictions, budgets.
- policy statements—their impact on the environment, the economy generally, on specific segments of the economy and society, and on international trade and relationships.

Debate the pros and cons of various government actions and involvement. Analyze the economic and environmental impacts and consequences, as well as the impact on the energy challenge.

2. Study the political and economic relationships of the U.S. with OPEC as an organization and with the individual countries within OPEC over the past few years. How have attitudes, policies, and diplomatic relationships changed? What further changes do you predict? How might OPEC use oil as a political tool in negotiating with the U.S. and other nations? How would you like to see the U.S. position change or progress in years ahead?

3. Study the worldwide supply/demand picture for energy—who has it, who needs it, how to distribute available energy equitably, how to avoid serious economic and environmental dislocations, how to avoid serious conflicts among nations, how to develop new energy sources without long-lasting environmental consequences, and how to achieve cooperation among nations.

ELEMENTARY AND MIDDLE SCHOOL ACTIVITIES

Activities appropriate for younger students to learn about the energy situation will allow them to work at their own speed, follow their own interests, and at the same time, learn to work together. Choose and modify the activities to meet the needs and ability levels of your students.

Lower Grades One to Four

1. Arrange field trips for students to see and learn firsthand about energy and ecology concerns. Places to visit would include:

- utility companies
- power plants
- recycling centers
- water purification plants
- city dump
- air and water testing stations
- beautification projects
- a solar heated home or building

Plan each field trip with specific goals, learning objectives, questions to ask, and things to look for. Follow up with discussion and class or individual projects related to the field trip. For example, before or after a trip to a recycling center, collect items to be recycled. After a trip to a beautification project, carry out a class beautification project at the school or in the community.

2. Put together a bulletin board or a display of these commonly used energy-consuming products—dishwashers, water heaters, clothes washers and dryers, freezers, and refrigerators—along with the information from each appliance's energy information label which gives the estimated annual operating cost of the particular model of appliance in dollars.

3. Draw up "I Can Do It Myself" lists of ways each person can

save energy, save water, and protect the environment. For example:

I CAN DO IT MYSELF

To Save Energy

- walk or bike instead of driving
- turn off lights not in use
- turn off television when finished

To Protect The Environment

- use less water for a bath
- save papers, glass, and metals to recycle

To Save Water

- take a shower instead of a bath
- shorten showers
- turn faucets completely off

4. Introduce youngsters to key energy and ecology terms and related economic concepts. Start with the following and add to the lists as comprehension and reading levels progress. For vocabulary building, try an energy word-of-the-week or word-of-the-day with each student taking a day to bring in a word for the class. A beginning vocabulary might include:

Energy

watt
kilowatt
fossil fuel
solar energy
nuclear power
conservation
electricity

Ecology

recycle
pollute
pollutant
solid waste
environment

Economics

supply
demand
scarcity
import
export

5. List and make posters illustrating at least five conservation measures that save both water and energy.

6. Set up a committee on resource conservation to keep up with news connected with resource shortages, conservation programs, problems, and possible solutions. Allow time for the committee to report to the class once each week.

Middle Grades Five through Eight

1. Investigate local sources of power—electricity, gas, fuel oil. Find out how most homes and buildings in the community are heated, where power comes from, peak usage periods, heaviest energy users, price structures for electricity and gas, wasteful uses, ways to conserve, and other pertinent information related to energy use in the community. Write findings in a "Did You Know" report for the school or local paper.

2. Carry out a community study of water and air pollution problems, land use and abuse, zoning laws and building codes with particular emphasis on how any of these relate to energy use and demands. Discuss findings and look for possible solutions and policies for dealing with problems.

3. Plan and organize school- or community-wide energy conservation and environmental protection projects such as "Clean Up the Park Day," "Save a Watt Week," "Recycle Rubbish." For example, to launch an energy conservation project, students might put together and run off copies of energy-saving tips and distribute them at school, the public library, supermarkets, and bus and train stops.

A similar project can be planned for water conservation.

4. Work with the local park district or garden club or environmental group to set up a bike and hike path, establish a recycling collection center, run a week-long hot line, or a weekly column on energy and water savers.

5. Make a survey of local businesses to learn how they have been or would be affected by serious fuel shortages over a long period of time, what they have done or would be willing to do about recognized environmental problems in the community, what energy saving practices they could put into use.

6. Develop a "Three-E Aptitude and Awareness" test for parents and other adults designed to present important facts on the three Es and to motivate adult awareness of problems and conditions related to the three Es. Include questions on energy such as the energy efficiency of various appliances, local rates for electricity and gas, and ways to save energy when driving. On ecology, cover both local and national environmental concerns related to energy and economics. In economics, use questions on the economic consequences and happenings related to energy shortages, uses, and production. Circulate the test, tabulate the answers, and report on the results.

7. Conduct a study to learn what the water supply demand is in a community. Find out about:

- Current and predicted water levels
- Rate structures
- Sources of water
- Use of water—particularly the breakdown among residential, communities, industrial, and agricultural

HANDS-ON ACTIVITIES FOR THE CLASSROOM

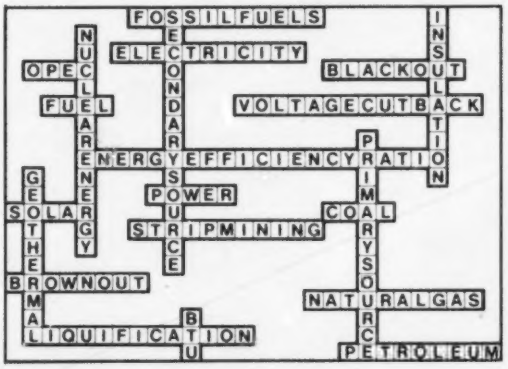
The following activities were developed for classroom use by Dr. Valerie M. Chamberlain and Dr. Joan M. Kelly, Associate Professors of Home Economics Education at Texas Tech University, Lubbock, TX.

Dr. Chamberlain and Dr. Kelly are the co-authors of "Survival: A Guide to Independent Living," and "Creative Home Economics Instruction." In addition, Dr. Chamberlain is co-author of "Teen Guide to Homemaking," and Dr. Kelly is co-author of "Today's Teen."

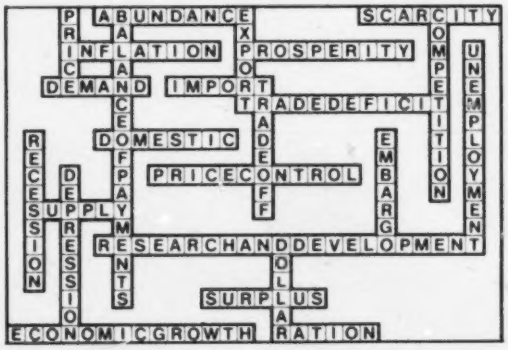
Permission is granted to teachers to reproduce the following activities on pages 17-19 in this publication for their own classroom instructional purposes.

Answers to:

ENERGY EQUATION



ECONOMIC ESSENTIALS

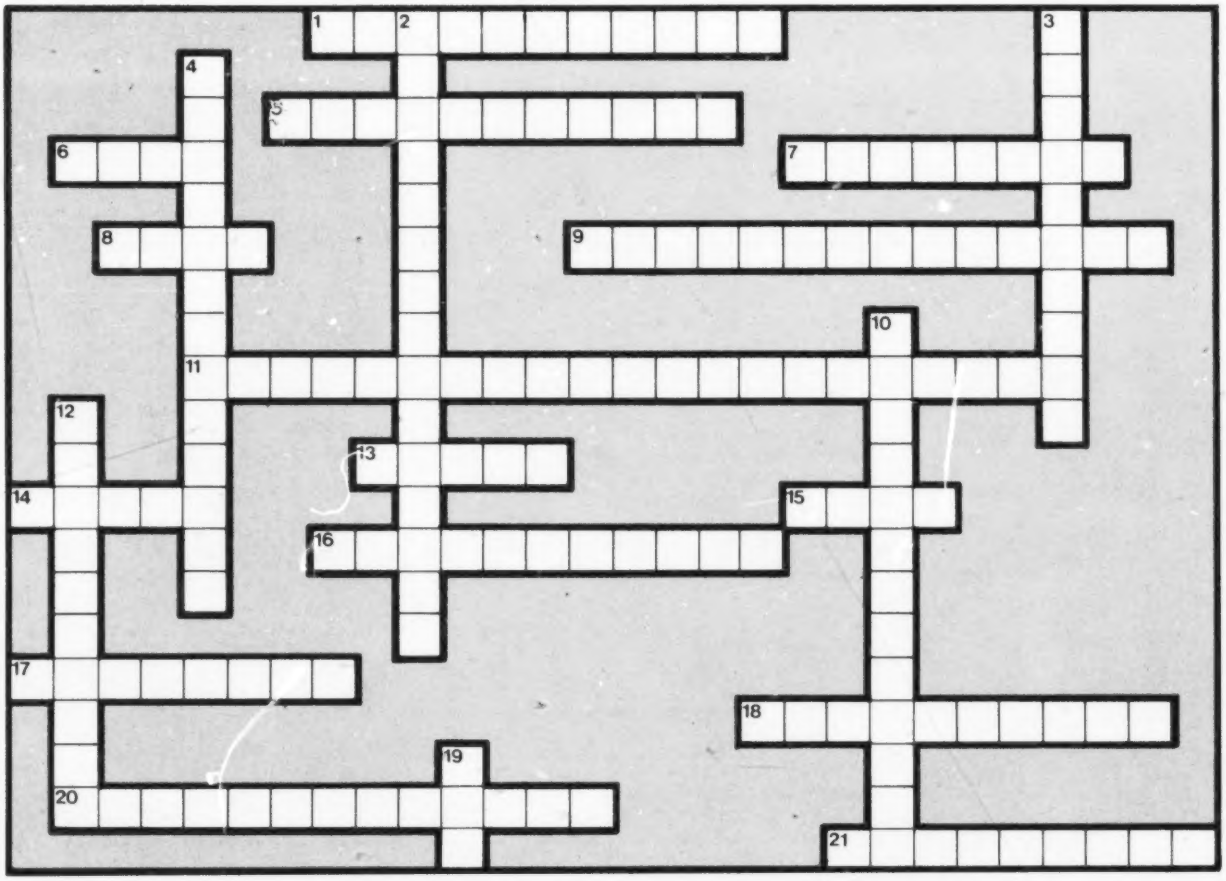


SAYING YOUR ABCs

E
three
fate (or state)
energy
supply
lands
waste
alive
make
window
action
bill
shower
economy (or country)
too
C

WORD SEARCH PUZZLE

ENERGY EQUATION



ACROSS

1 A general term describing sources of energy obtained from under the ground such as oil, gas and coal. (2 words)

5 Current supplied for lighting, heating and cooling.

6 The initials of an association of the major oil producing countries of the world.

7 A loss of power in an area due to failure of equipment producing or transmitting energy. (2 words)

8 A name given to products burned to supply heat.

9 Intentional reduction of power available for use due to heavy demand from customers. (2 words)

11 A number value appearing on an air conditioner which tells how energy efficient a unit is. (3 words)

13 A force or energy which can be put to work to produce heat and/or light.

14 A word used to describe energy coming from the sun.

15 A solid mineral energy source formed over a period of millions of years.

16 A method of taking a mineral, like coal, from the earth by digging along the earth's surface. (2 words)

17 A condition, such as dim lights, resulting from little power available due to heavy use. (2 words)

18 A form of fuel, neither liquid nor solid, found in the earth. (2 words)

20 To change from a solid and/or gas to another state.

21 A form of fuel used to make products such as plastics and synthetic fabrics.

DOWN

2 A term used to describe a less important source of energy such as energy from the sun. (2 words)

3 Material used to prevent loss of heat from a house.

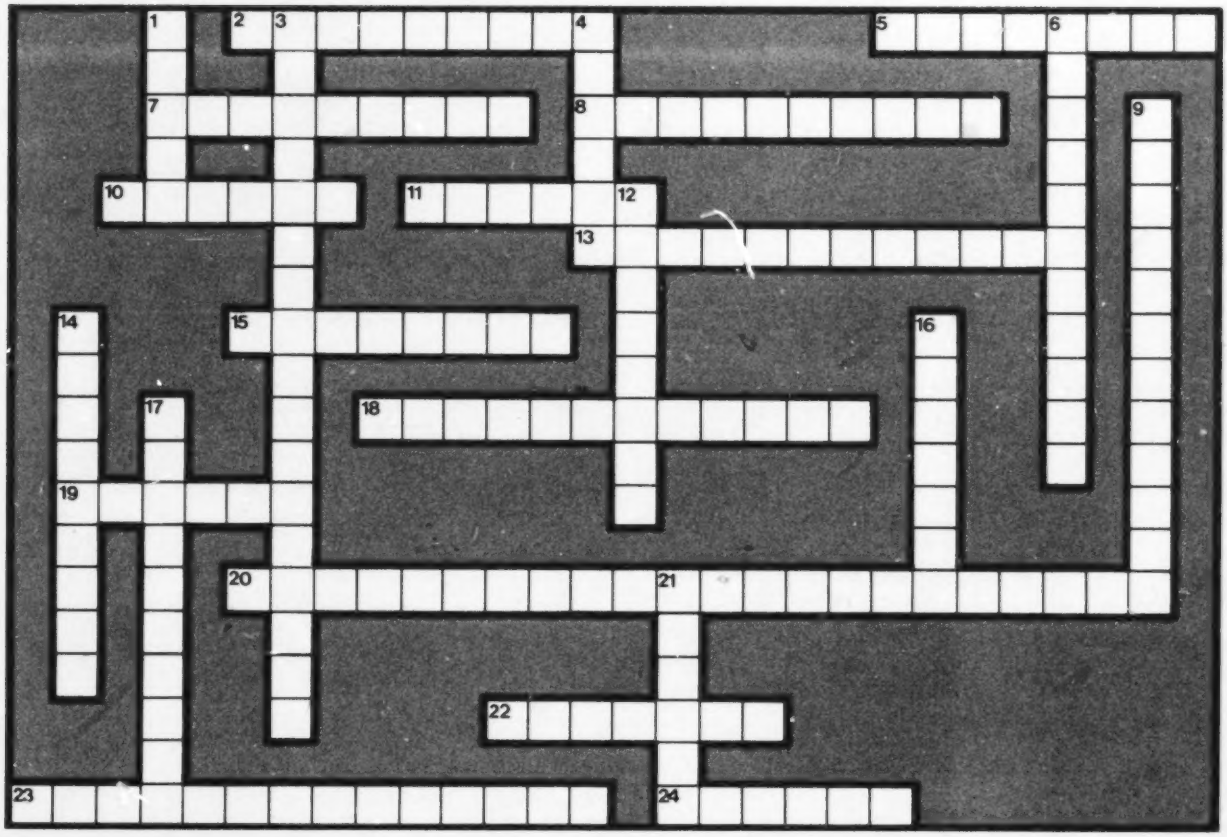
4 A form of power obtained from the movement of atoms. (2 words)

10 A term used to describe an important and basic source of energy such as oil. (2 words)

12 Having to do with the heat of the earth's interior.

19 The abbreviation for a unit or measurement of heat.

ECONOMIC ESSENTIALS



ACROSS

2 A plentiful supply of means or resources.

5 Smallness of quantity or number in proportion to the wants or demands.

7 A condition existing when prices rise and money goes down in value.

8 A description of a time when most people are employed and prices are not rising rapidly.

10 Term describing need for or call for a product.

11 To bring in goods from another country for the purpose of selling them at home.

13 When a country imports more than it exports to another country. (2 words)

15 Products produced in one's own country.

18 When the government sets a limit on the cost of a product to consumers. (2 words)

19 The amount of goods actually available.

20 A branch of industry which comes up with new ideas and new products. (3 words)

22 When there is more of a product than is needed or wanted.

23 A sign of the health of the economy. (2 words)

24 To limit the amount of goods available to the public when supplies are short.

DOWN

1 The amount of money asked or paid for a product.

3 Term describing the amount of money countries owe one another for imports and exports. (3 words)

4 When a country sells goods by carrying or sending them to another country.

6 A condition in the market-place which may cause prices to go down.

9 A state existing when people are out of work.

12 What is gained and lost when certain decisions are made. (2 words)

14 A temporary decline in business activity when business has generally been good.

16 When a country limits all trade or trade of a certain product with another country.

17 A period of time with a business slow down, increased unemployment, falling prices, and lower salaries.

21 A unit of money for payment of goods.

YOUR ABCs

IT'S AS EASY AS SAYING YOUR ABCs TO FILL IN THIS POEM ABOUT THE THREE Es

Fill in the blank on the second line
With a word that completes the rhyme.
It's easy and fun for you to do
'Cause nobody cares if there's a boo-boo.
It's all a matter of having fun
In coming up with your own pun.
We've left a word for you to supply.
Come on, it's worth giving it a try.
An example first before you begin.
See how easy it is to fill _____?

It is very plain for all of us to see
That *Energy*, *Ecology*, and *Economics* begin with _____.

It's also clear to you and me
That there's interaction among the _____.

Because the three Es interrelate
They have great impact on our _____.

It's also clear we'll cease to be
Unless we do more to conserve _____.

You may question and now ask why
We find oil in short _____.

Our way of life makes great demands
On oil obtained from foreign _____.

Now our country must act with haste
To stop oil and gas from further _____.

Driving at speeds of fifty-five
Not only saves gas, but keeps you _____.

There are many steps that we can take
Around our homes, improvements to _____.

Heat takes less of an outward flow
If you install a storm _____.

Spaces around a door—only a fraction—
Should send you into very quick _____.

Attic insulation isn't a frill
And it helps you save on your heating _____.

In order to save hot water power
It pays to take a very quick _____.

By saving on your utility fee
You also help the whole _____.

There are many things that you can do
To help yourself and your country _____.

Just keep in mind the important three
They're as easy to say as A, B, _____.

WORD SEARCH PUZZLE

Search through the puzzle below and circle the 30 hidden words. The words all relate to energy, ecology, or economics. The words are in straight lines—across, down, backward, and diagonally. Letters in some words overlap.

R E S O U R C E S E A
E N S A V E O X D E N
L V W O G X A Z E C O
I I I F U E L E M O I
O R A L O S X N A N T
P O L L U T I O N O A
E N E R G Y W Z D M L
T M X E C O L O G Y F
R E X P O R T P Z X N
O N O T E T R O P M I
L T A W A T E R S U N
E X O R X P R I C E S
U P I X E L C Y C E R
M A R K E T P L A C E

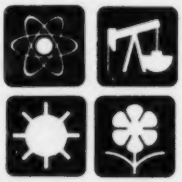
Air	Import	Prices
Coal	Inflation	Recycle
Demand	Live	Resources
Ecology	Marketplace	Save
Economy	Note	Sea
Energy	Oil	Solar
Environment	Ozone	Sun
Export	Petroleum	Supply
Fuel	Pollution	Tax
Gas	Power	Water

RESOURCES

Information on the three Es is available from a variety of sources —associations, government agencies, businesses, as well as newspapers and magazines. Most sources listed in this section distribute information on one or all of the three Es.

One student from your class might write several of the sources on behalf of the class, asking for publications or a listing of materials available and the prices (as not all materials are free).

A search through the vertical index in the school or public library will produce sources of recent articles and students can bring in articles appearing in newspapers and magazines.



ASSOCIATIONS, INSTITUTES, COUNCILS

Air Pollution Control Association
P.O. Box 2861
Pittsburgh, PA 15230

American Bankers Association
1120 Connecticut Ave., N.W.
Washington, DC 20036

American Enterprise Institute for
Public Policy Research
1150 17th St., N.W.
Washington, DC 20036

American Gas Association
1515 Wilson Blvd.
Arlington, VA 22209

American Home Economics Association
2010 Massachusetts Ave., N.W.
Washington, DC 20036

American Petroleum Institute
2101 L St., N.W.
Washington, DC 20037

Chamber of Commerce of the United States
1615 H St., N.W.
Washington, DC 20062

Citizens Energy Project
1413 K St., N.W.
Washington, DC 20005

Clean Water Action Project
3141 G St., N.W.
Washington, DC 20005

Committee for Economic Development
477 Madison Ave.
New York, NY 10022

Conservation Foundation
1717 Massachusetts Ave., N.W.
Washington, DC 20036

Consumer Alert, Inc.
1091 Post Rd.
Darien, CT 06820

Consumer Energy Council of America
1990 M St., N.W.—Suite 620
Washington, DC 20036

Edison Electric Institute
90 Park Ave.
New York, NY 10016

Electricity Consumers Resource Council
1225 Connecticut Ave., N.W.
Washington, DC 20036

Energy Action Educational Foundation
1523 C St., N.W.
Washington, DC 20005

Energy and Man's Environment
0224 S.W. Hamilton—Suite 301
Portland, OR 97201

Institute of Gas Technology
3424 S. State St.
Chicago, IL 60616

Joint Council on Economic Education
1212 Avenue of the Americas
New York, NY 10036

League of Women Voters of the United States
1730 M St., N.W.
Washington, DC 20036

Motor Vehicle Manufacturers Association
of the United States
300 New Center Building
Detroit, MI 48202

National Association of Electric Companies
1140 Connecticut Ave., N.W.
Washington, DC 20036

National Association of Securities Dealers
1735 K St., N.W.
Washington, DC 20006

National Business Education Association
1906 Association Dr.
Reston, VA 22091

National Coal Association
1130 17th St., N.W.
Washington, DC 20036

National Energy Information Center
1726 M St., N.W.—Room 240
Washington, DC 20461

National Petroleum Council
1625 K St., N.W.—Suite 601
Washington, DC 20009

National Science Teachers Association
1742 Connecticut Ave., N.W.
Washington, DC 20009

Resources for the Future, Inc.
1755 Massachusetts Ave., N.W.
Washington, DC 20036

Sierra Club
530 Bush St.
San Francisco, CA 94108

Soil Conservation Society of America
7515 N.E. Ankeny Rd.
Ankeny, IA 50021

Tax Foundation, Inc.
50 Rockefeller Plaza
New York, NY 10020

The Conference Board
845 Third Ave.
New York, NY 10022

BUSINESS AND COMMERCIAL ORGANIZATIONS

American Stock Exchange, Inc.
86 Trinity Pl.
New York, NY 10006

Amoco Oil Co.
200 E. Randolph
Chicago, IL 60601

Catalyst for Environment/Energy
274 Madison Ave.
New York, NY 10016

Chicago Board of Trade
141 West Jackson Blvd.
Chicago, IL 60604

Chicago Mercantile Exchange
444 West Jackson Blvd.
Chicago, IL 60606

Dow Jones & Company, Inc.
The Educational Services Bureau
P.O. Box 300
Princeton, NJ 08540

Dun & Bradstreet, Inc.
99 Church St.
New York, NY 10007

McDonald's Corporation
2111 Enco Dr.
Oak Brook, IL 60521

Merrill Lynch, Pierce, Fenner & Smith, Inc.
One Liberty Plaza
165 Broadway
New York, NY 10080

Morgan Guaranty Trust Company
of New York
23 Wall St.
New York, NY 10015

New York Stock Exchange
11 Wall St.
New York, NY 10005

PUBLICATIONS

American Scientist

Audubon

Baron's National Business and Financial Weekly

Black Enterprise

Business and Society Review

Business Week

Forbes

Fortune

Environment

Journal of Home Economics

National Geographic

Physics Today

Popular Science

Science

Scientific American

Search, Special Science and Environmental Research

The Science Teacher

GOVERNMENT AGENCIES

Bureau of Oceans and International
Environmental and Scientific Affairs
Department of State
2201 C St., N.W.
Washington, DC 20520

Council on Environmental Quality
722 Jackson Place, N.W.
Washington, DC 20006

Department of Commerce
Bureau of Census
Social and Economic Statistics
Administration
Smithland, MD 20233

Department of Commerce
Building Research Division
14th St. between E St. and
Constitution Ave., N.W.
Washington, DC 20230

Department of Energy
Office of Consumer Affairs
Room 8G031
Washington, DC 20585

Department of Health, Education
and Welfare
330 Independence Ave., S.W.
Washington, DC 20201

Department of Housing and Urban Development
451 7th St., S.W.
Washington, DC 20410

Department of Interior
C St. between 18th and 19th St., N.W.
Washington, DC 20240

Department of Labor
Bureau of Labor Statistics
200 Constitution Ave., N.W.
Washington, DC 20210

Department of Transportation
400 7th St., S.W.
Washington, DC 20490

Environmental Protection Agency
401 M St., S.W.
Washington, DC 20460

Federal Reserve Bank of
Atlanta, GA 30303
Boston, MA 02106
Chicago, IL 60690
Cleveland, OH 44101
Dallas, TX 75222
Kansas City, MO 64198
Minneapolis, MN 55480
New York, NY 10045
Philadelphia, PA 19105
Richmond, VA 23261
St. Louis, MO 63166
San Francisco, CA 94120

Federal Trade Commission
Pennsylvania Ave. at Sixth St.
Washington, DC 20580

Internal Revenue Service
Department of the Treasury
Washington, DC 20224

National Bureau of Standards
Washington, DC 20234

Nuclear Regulatory Commission
1717 H St., N.W.
Washington, DC 20555

Office of Consumer Affairs
Department of Health, Education
and Welfare
621 Reporters Bldg.
Washington, DC 20201

Small Business Administration
1441 L St., N.W.
Washington, DC 20416

Superintendent of Documents
U.S. Government Printing Office
Washington, DC 20402

U.S. Department of Energy
Technical Information Center
P.O. Box 62
Oak Ridge, TN 37830